

Developing Unicode-aware Applications in Python

*Preparing an application for
internationalization (i18n) and
localization (l10n)*

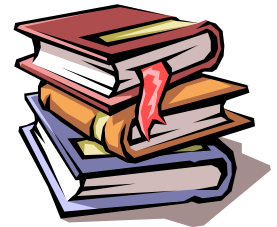
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Speaker Introduction: Marc-André Lemburg

- CEO eGenix.com and Consultant
 - More than 20 years software experience
 - Diploma in Mathematics
 - Expert in Python, OOP, Web Technologies and Unicode
 - Python Core Developer
 - Python Software Foundation Board Member (2002-04)
 - Contact: mal@egenix.com
- eGenix.com Software GmbH, Germany
 - Founded in 2000
 - Core business:
 - **Consulting**: helping companies write successful Python software
 - **Product design**: professional quality Python/Zope developer tools (mxODBC, mxDateTime, mxTextTools, etc.)
 - International customer base



Agenda

1. Introduction
2. Preparation for Internationalization
3. Adding Translation Support
4. Translation Tools
5. Interoperability
6. Localization
7. Discussion



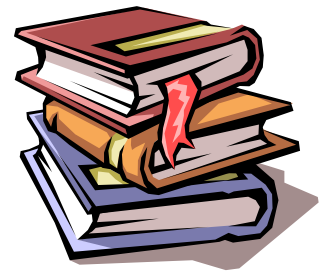
Introduction

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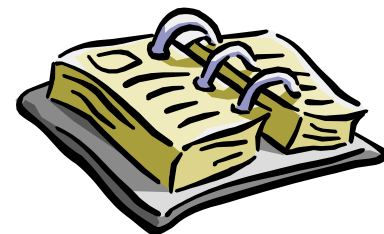
Motivation: Why Unicode ?

- Storing scripts: human readable text data
 - Localization (l10n) and Internationalization (i18n) of software and GUIs
 - Basis for national language and script support
 - Common ground for textual information exchange



The Unicode Consortium Solution

- One encoding for all scripts of the world
- ASCII compatibility (even Latin-1)
- Includes character meta data
 - Case mapping information
 - Numeric conversion
 - Character category information
- Accounts for scripts using different orientations
- Enables sorting and normalization support



Also see the Unicode Consortium web-site at <http://www.unicode.org/>

Unicode Terminology: What is a Character ?

- Unicode Terminology

André Ler

- Graphemes:

d r é L e

This is what users regard as a character.

- Code Points:

d r e ' L e

U+0301
Combining
Accent Acute

This is an Unicode encoding of the string.

- Code Units:

d r e ì □ L e

0xCC 0x81
UTF-8 for U+0301

This is what the implementation stores (UTF-8).

Unicode Statistics

- Unicode 4.1.0
 - 1,114,112 code points available
 - 97,655 code points assigned
 - 1,273 code point assignments were added in Unicode 4.1.0 compared to Unicode 4.0
 - 70,207 of these are part of a Han subset used for Asian scripts
 - Most assignments in the first 65536 code points (BMP - Basic Multilingual Plane)
- Python supports Unicode version 3.2 (in Python 2.4)

Unicode features included in Python

- Native **Unicode Type**
 - very efficient
 - performance comparable to strings (sometime even better)
- Large set of built-in **codecs**
 - to convert between Unicode and various encodings (among other things)
- Unicode **code point database**
 - information on code point properties
- Partial support for OS based Unicode I/O
 - still in the making

Unicode literals in Python

- Source code encoding
 - Defines the encoding used for the Python source code
 - Must appear in the first two lines of a Python program
 - Format: `# -*- coding: latin-1 -*-`
- Unicode literals
 - String literals prefixed with a small *u*
 - Get converted to a Unicode object
 - Format: `u"this is a latin-1 string (éèàôäöü)"`

Pitfalls in writing Unicode-aware Python applications

- Not all Python modules/extensions expect Unicode
 - UnicodeError (due to ASCII conversion)
 - TypeError (tool expected a string)
 - Work-around: explicit encoding/decoding
- Operating Systems
 - don't all handle Unicode well
 - Python doesn't always use their Unicode support
 - Work-around: use ASCII OS-identifiers wherever possible
- Tool-chain:
 - Unicode is still in the process of being adopted
 - we're not quite there yet... YMMV

Preparation for Internationalization (i18n)

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General principles in preparation for i18n

1. Use Unicode for all text in the application / presentation data
 - Avoid mixing strings and Unicode
2. Use explicit encoding/decoding in all I/O operations
 - Avoid Python's automatic coercion mechanisms
 - Encodings are usually application and locale dependent

I18n approach in Python: Basics

- Choose a **default language**
- Always **define the source code encoding**
 - should be suitable for your default language
 - Example: `# -*- coding: latin-1 -*-`
- Always **use Unicode literals for all text**
 - written in your default language
 - Example: `u"use your preferred default language"`
 - Important:
These strings will be used as keys to find their own translation

I18n approach in Python: Prepare for automatic translation

- Enclose all literals in a call to a translation function

```
translate(u"Save Document")
```

```
translate(u"Save Document", topic=u"Menu")
```

```
_(u"Save Document") (for those who don't like typing ☺)
```

- Always inline formatting specifiers into literals

```
_(u"this will cause ") + many + _(u"translation problems")
```

```
_(u"this is much %s translation friendly") % (more)
```

- Try not to break literals unnecessarily

```
_(u"complete sentences are usually easier to translate...")
```

```
_(u"...than short snippets without context")
```

Translation Problems

- Strings can have **different translations** depending on context
 - Use **topics** (aka domains, categories)
- A single string in one language can have **multiple translations** in other languages
 - Try to **make the string more descriptive**, or
 - Add helper context which the translation function then removes again for the default language
- **Missing translation ?**
 - Fallback to the **default language**

Adding Translation Support

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Translation Tools: GNU gettext tool chain

- Python `gettext module` (Python license)
 - provides translation function
- Many available tools:
 - to extract literals from source code (xgettext)
 - manage translations
 - compile translations for quick lookup
- Problem:
 - limited topic support
 - not context-aware (at least not out of the box)
 - hard to extend

Translation Tools: eGenix approach

- Use a **TranslationComponent** in the application
 - translations stored in the database
 - provides translation function
 - “knows” what the application is doing: **context aware**
- String extraction:
 - **dynamically** at run-time
 - **statically**, by scanning source code and/or presentation data

Translation Tools: eGenix approach (cont.)

- Managing translations:
Import/export translations to **Excel Unicode CSV files**
 - easy to pass to translation studios
 - can include topic information
- Advantages of the approach:
 - context- and topic-aware
 - easily extendable
 - tested and proven in real-life applications

Interoperability

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Application Interoperability

- For best interop, **use UTF-8** as Unicode transfer format
 - Best supported transfer format
- **Avoid UTF-16**, if possible
 - Byte ordering issues can be troublesome
- **Avoid lossy encodings** such as Latin-1, ASCII, etc.

Common Unicode transfer formats

- Browsers
 - UTF-8 (good support on all platforms)
- Text Editors
 - UTF-8 (Joe, Emacs on Unix)
 - UTF-16-LE (Notepad, Word on Windows)
- Excel
 - CSV files: UTF-16-LE
- Terminals / Shells
 - UTF-8

Detecting character sets / encodings

- Very hard problem (in general)
- Some encodings help
 - UTF-16 uses BOMs (byte order marks)
 - UTF-8 sometimes does too
- The application may have enough knowledge to detect the encoding based on the context ...
 - ... or it may not ☹

Localization (l10n)

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General things to consider when localizing (l10n)

- Date formats
 - 2005-07-07 vs. 07.07.2005 vs. 07/07/2005
- Number formats
 - 1.234,567 vs. 1,234.567
- Currency formats
 - \$12.34 vs. €12,34 vs. 12.34 MUR
- Translations for **varying quantities**
 - Singular and plural form: u"%i file(s)"
 - Empty set or zero: u"no files"

GUI considerations

- **Text direction:** Left-to-right vs. Right-to-left
 - Text
 - Menus
 - Buttons
- Varying sizes of glyphs depending on language
 - e.g. English compared to Japanese
- Accelerator Keys
 - will likely have to depend on the language

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Developing Unicode-aware applications in Python

- Questions
 - What is your biggest problem with Unicode ?
 - What tools / features are (still) missing in Python's Unicode support ?



And finally...



Thank you for your time.

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